All Organic Optical Up-converter Devices based on sensitive near-infrared cyanines

M. Cremona

Physics Department, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil
cremona@fis.puc-rio.br

Near-infrared (NIR) imaging devices have attracted considerable research interest due to potential applications in different areas such as night visions, biological imaging, telemetry and security [1]. All organic up-converter devices are enabling to do high resolution imaging in the near-infrared and have low manufacture costs associate in comparison of other inorganic and hybrid inorganic-organic up-converter devices.

The Organic Optical Up-converter Device (OUD) consists in a tandem structure with NIR sensitive organic photodetector (PD) stacked in an efficient visible Organic Light Emitting Diode (OLED). In the dark, holes are blocked at the anode, no hole current is flowing, and the device is in the off-state. When NIR light is absorbed by the PD, electron-hole pairs are formed. Under the appropriate bias, holes are driven into the OLED where they recombine with electrons injected from the cathode, thus leading to light emission.

In this study, NIR sensitive cyanines dyes were used as NIR photodetector layer to develop conventional and Transparent OUDs. Cyanine dye like Cy7-T [2] and others [3] show a strong NIR absorption band with a maximum around 850-900 nm. OUDs were manufactured by a sequential deposition of thin films through spin-coating or thermal evaporation techniques onto ITO glass substrates. Devices based on Cy7-T present a current and optical power gain among two and three orders of magnitude, when NIR light from a diode laser is directed onto the devices [4]. These results and others will be presented and discussed in this talk.

Keywords: OUD, OLED, cyanines, Electroluminescence, Organic Electronics.

Acknowledgements

This work was supported by CNPq, CAPES and FAPERJ.

References

[1] F. So et al. Advanced Materials, 22, (2010), 2260–2263.
[2] R. Hany et al. Scientific Reports 5, (2015), 9439.
[3] M.C. Melquíades, R. Aderne, M. Cremona et al. Optical Materials 69, (2017), 54–60.
[4] K. Strassel, M. Cremona, H. Roland et al. ACS Applied Materials and Interfaces, 11 1235 (2018)